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An Innovative Approach to Lower the Risk of Software-Intensive Development Programs

Dunlap, Jeff

Monterey, California. Naval Postgraduate School

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An Innovative Approach to Lower the Risk of Software Intensive Development Programs

Jeff Dunlap
Director Navy C4ISR
Jeff.dunlap@baesystems.com

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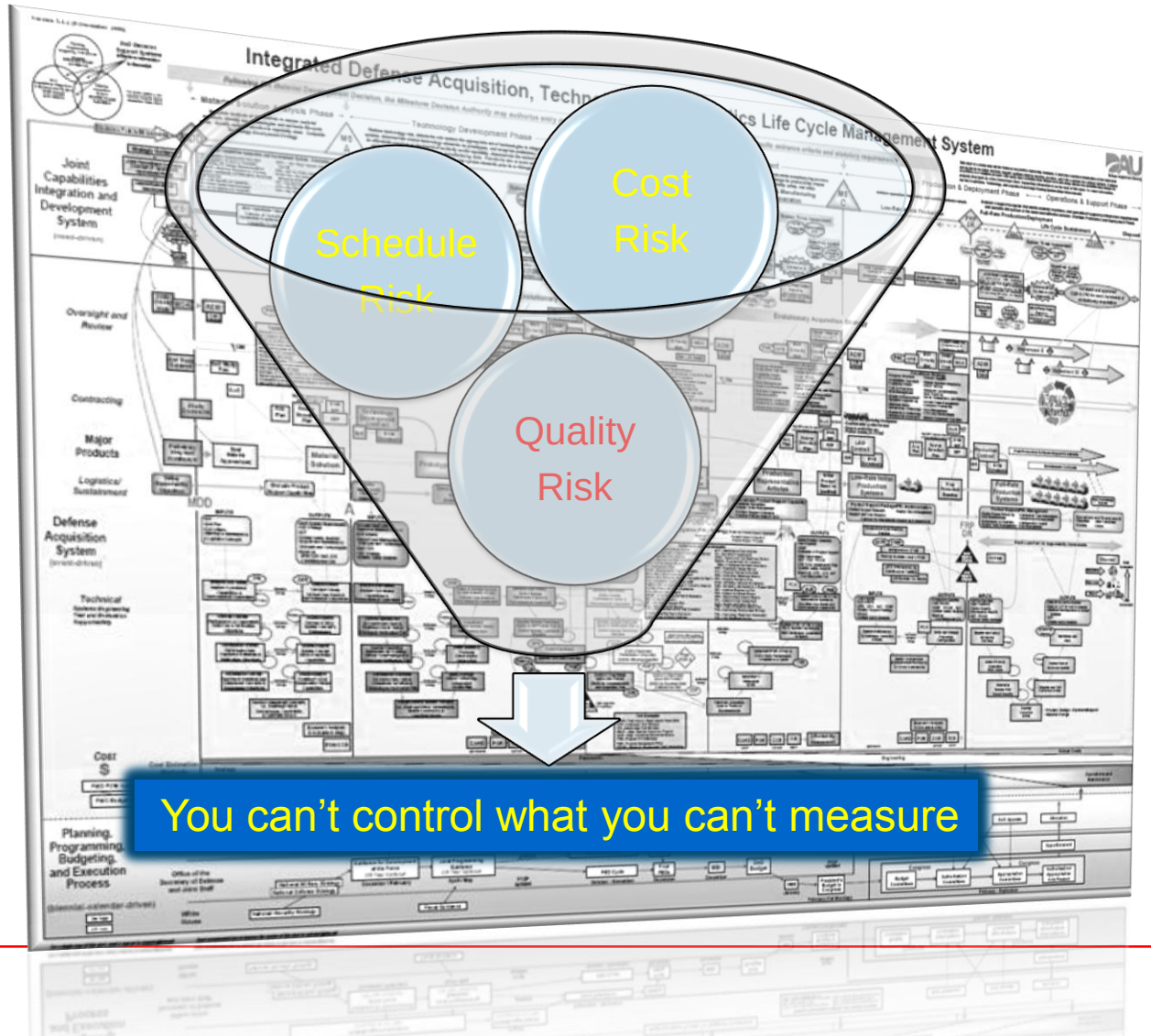
Assertion: Less risk = greater probability of success



Elements needed to control risk

- ☑ constant measure of schedule achieved
- ☑ constant measure of actual cost incurred
- ☑ constant measure of quality tested

- ☑ Agile Earned Value

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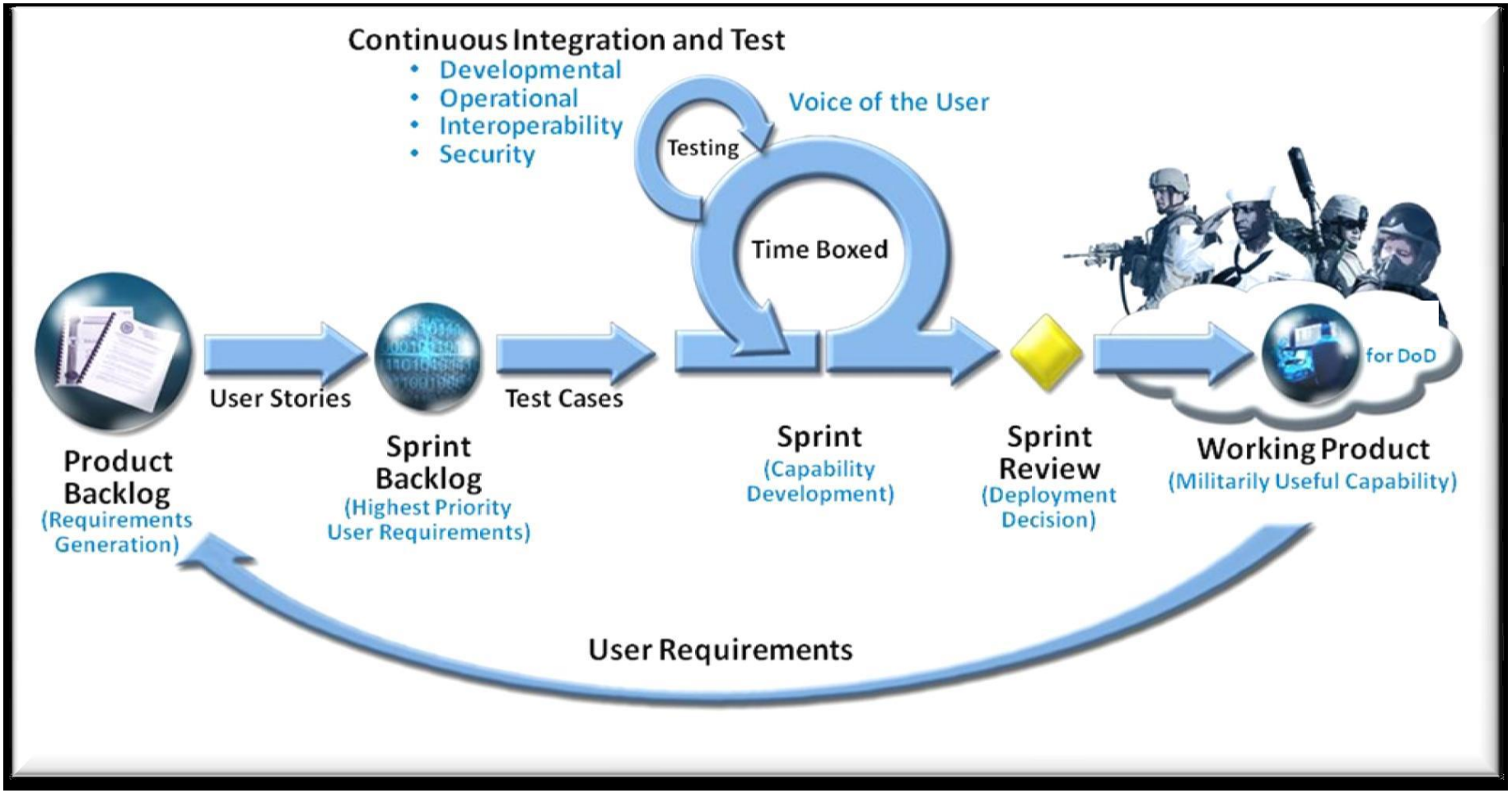
Agile Development



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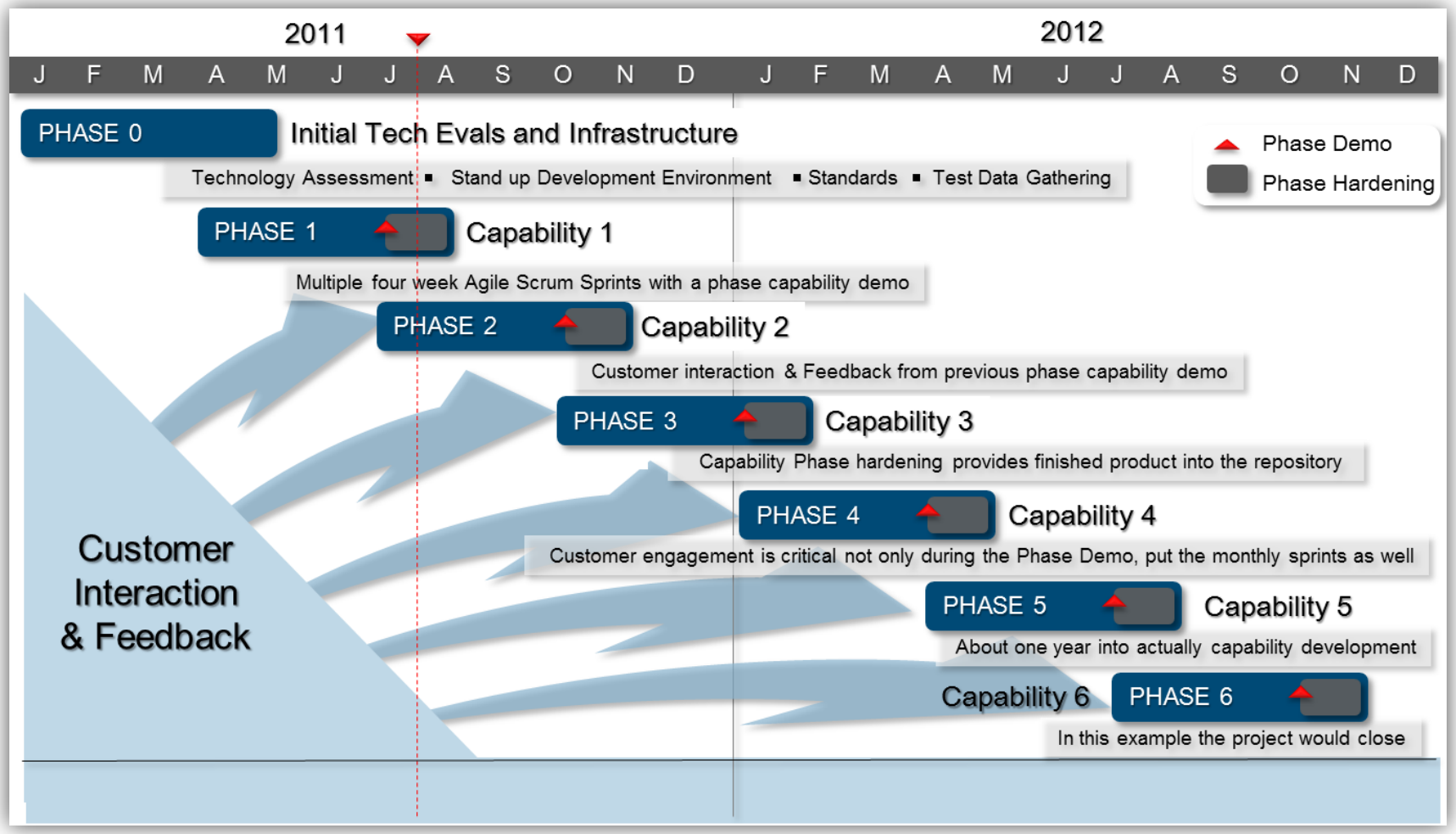
Industry example of a System Capability Roadmap



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Agile four week Scrum Sprint within a capability phase

Week 1	Mon	Tues	Wed	Thrs	
Team			daily SCRUM	daily SCRUM	
Leads & CE	Story Prioritization		SCRUM of SCRUMS	SCRUM of SCRUMS	
Leads	Move Stories into JIRA				
Team		Move Tasks into JIRA			Off Friday
	Bugs & Improvements				
	Design, Deliver, Accept - Update JIRA Status daily				
	Backlog prep for next Sprint				
All			Weekly Team Meeting		
PM	Determine Velocity / Feedback Loop to Planning		Status GreenHopper Tasks & Stories		

Week 2	Mon	Tues	Wed	Thrs	Fri
Team	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM
Leads & CE	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS
Team	Bugs & Improvements				
	Design, Deliver, Accept - Update JIRA Status daily				
	Backlog prep for next Sprint				
All			Weekly Team Meeting		
PM	Status GreenHopper Tasks & Stories				

Week 3	Mon	Tues	Wed	Thrs	Fri
Team	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM	
Leads & CE	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	
Team	Bugs & Improvements				
	Design, Deliver, Accept - Update JIRA Status daily				Off Friday
	Backlog prep for next Sprint				
All			Weekly Team Meeting		
PM	Status GreenHopper Tasks & Stories				

Week 4	Mon	Tues	Wed	Thrs	Fri
Team	daily SCRUM	daily SCRUM	daily SCRUM	daily SCRUM	
Leads & CE	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	SCRUM of SCRUMS	
eads & CE		Propose Next-Sprint Stories, Review Backlog			
	Bugs & Improvements				
	Design, Deliver, Accept - Update JIRA Status daily			JIRA Close-out	
	Backlog prep for next Sprint			Sprint Release / Design Review / Demo	
			Weekly Team Meeting	Retrospective	
	Status GreenHopper Tasks & Stories			Run Final Reports / Update Velocity	

Constant measure of schedule achieved

Constant measure of actual costs incurred

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Measure of quality tested

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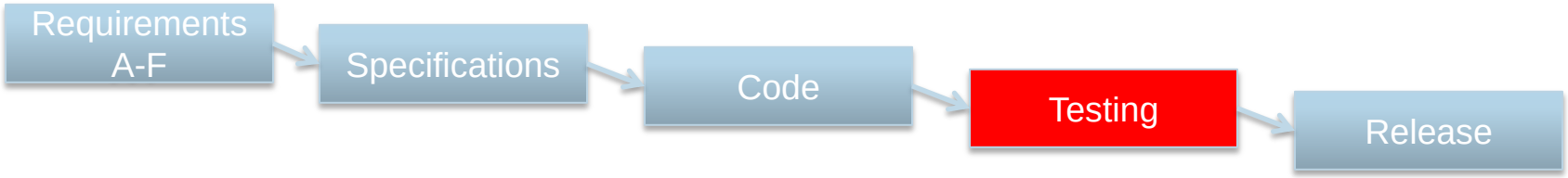
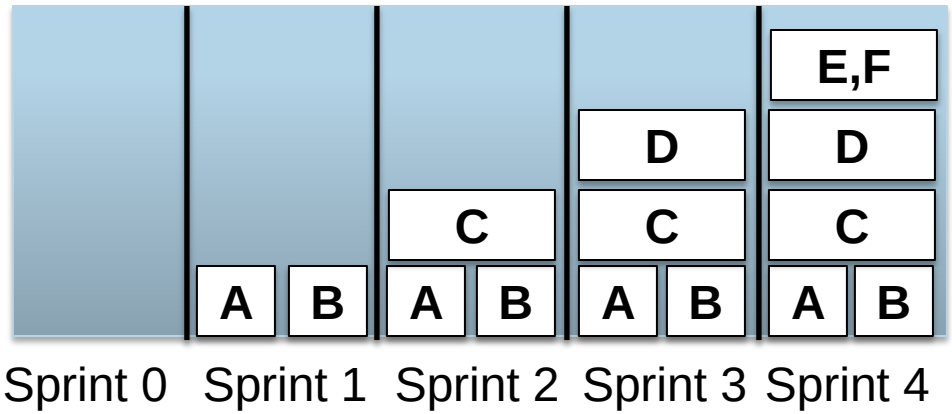
Traditional vs. Agile Testing

Traditional



Agile



Agile produces working, tested, and deployable software sooner

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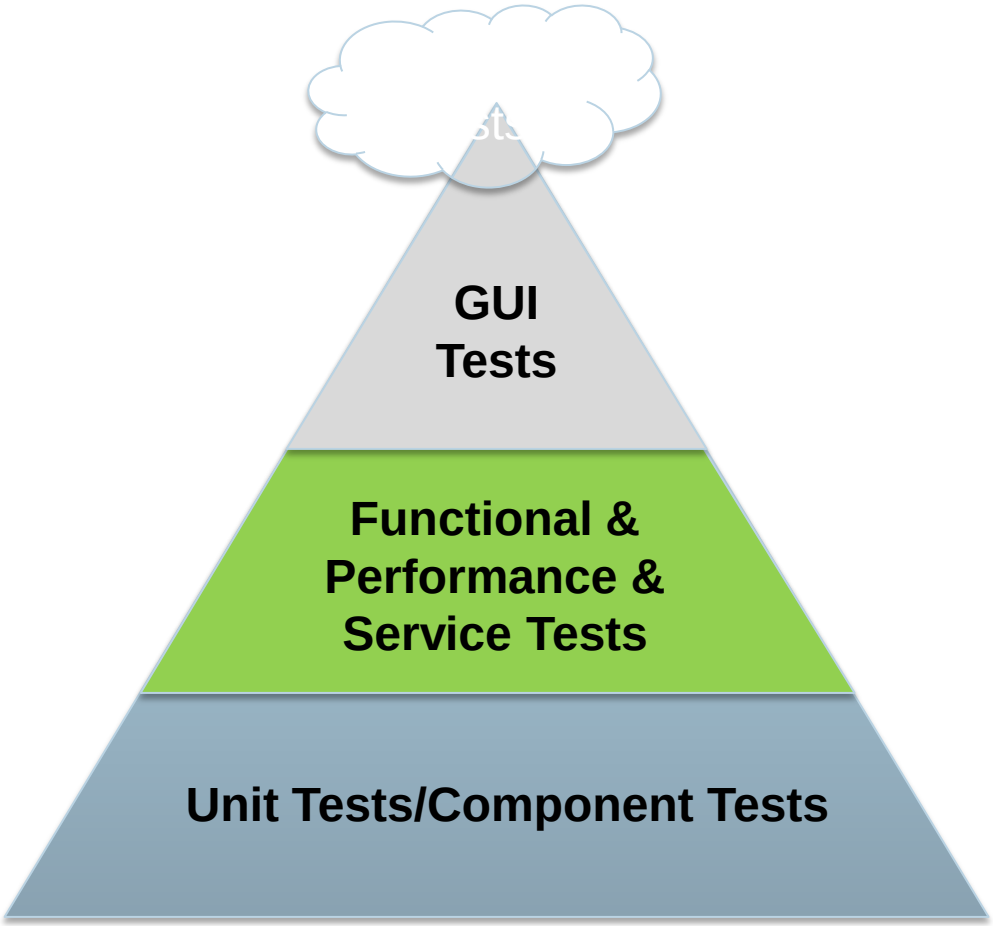
Test Automation Pyramid



Goal is to achieve 100% automation at the Unit Level – where the best ROI occurs

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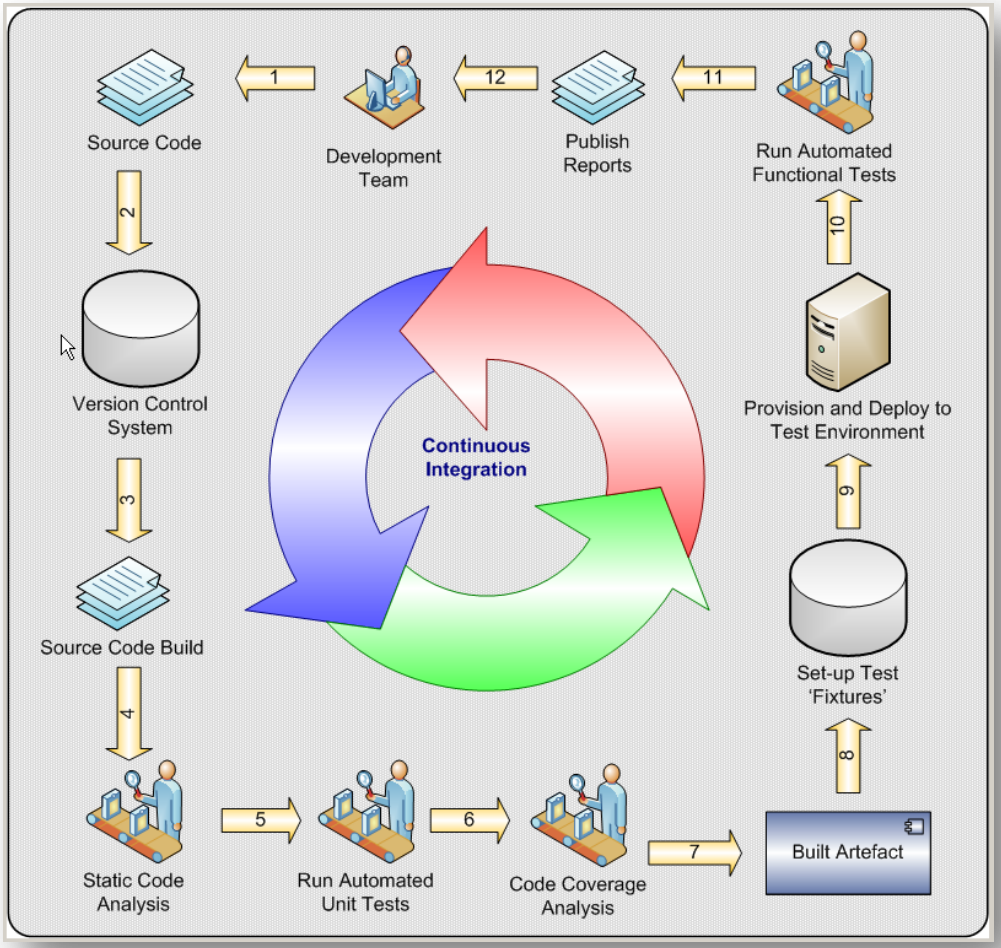
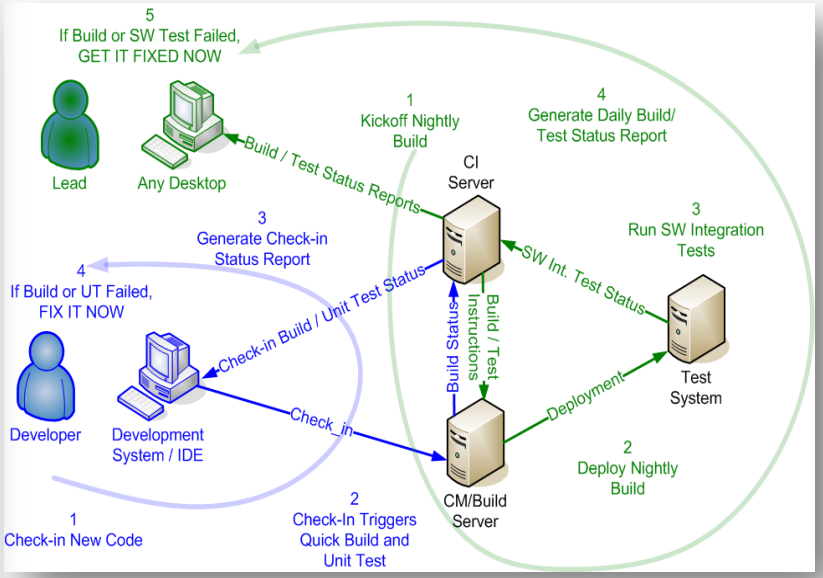
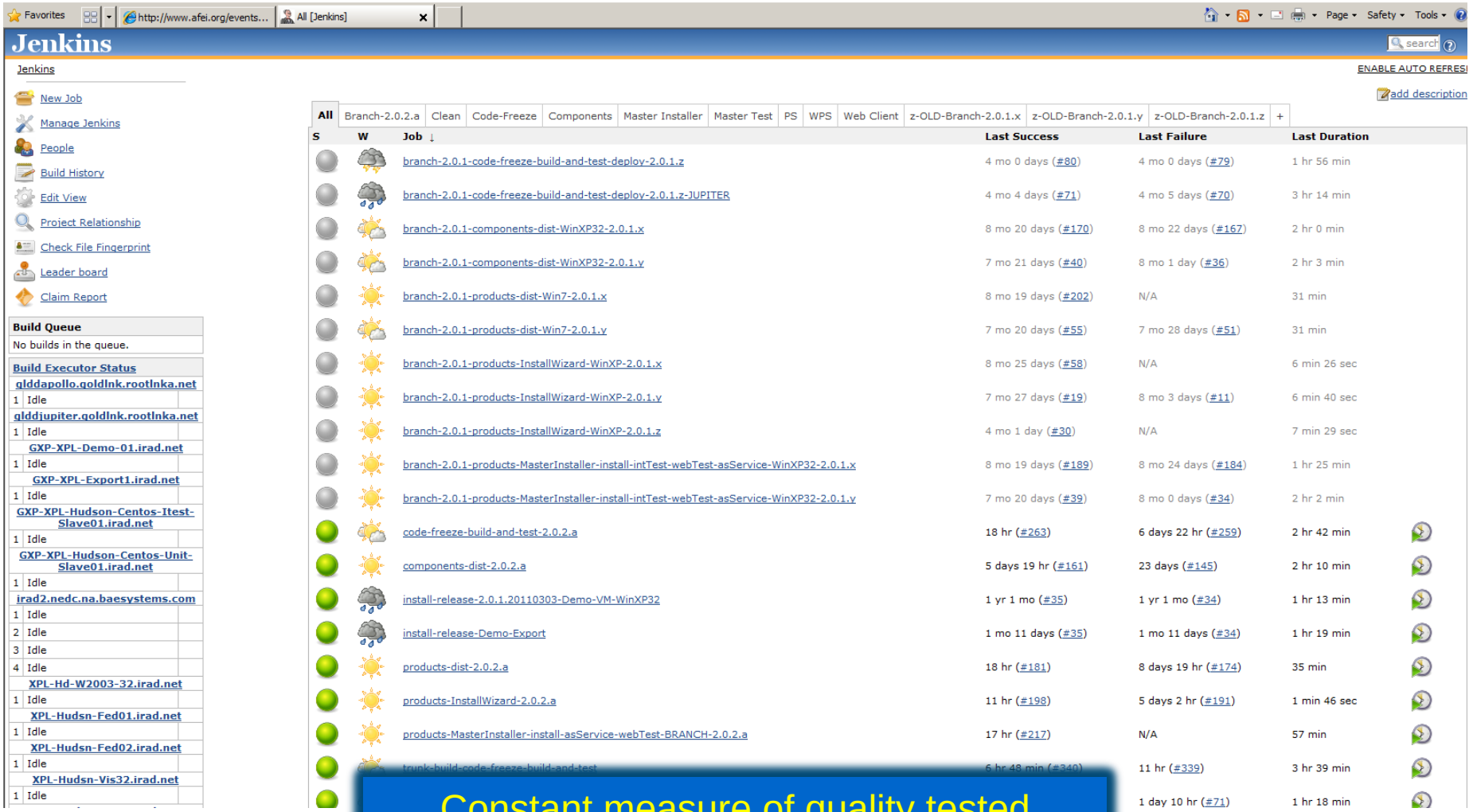
Continuous integration and test





Continuous Integration and Testing environment using COTS, Open Source CI tool



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Agile with Continuous Integration and Test

- When an capability development phase is planed, time is held “fixed” within the iterations (i.e., multiple four week Agile Scrums)
  - It becomes *obvious* at the daily meetings (both by CI&T automated results and discussions with the programmers) where the difficulties are occurring
  - Peer / Team relationships foster a culture of feedback and improvement
  - Schedule adherence or deviations is near real-time
- Actual cost are accounted for daily and reviewed weekly
  - Actual costs rise and fall proportionally to the degree of difficulty difference from the “Planned” tasks
- Quality of the software under development is monitored nightly by CI&T
  - Metrics collected show trends and areas of concern
  - Decisions can be made with insight about high risk areas

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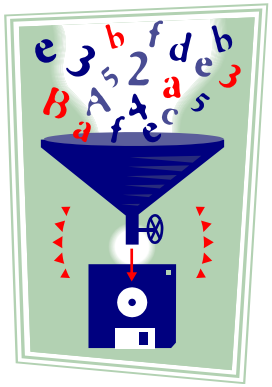
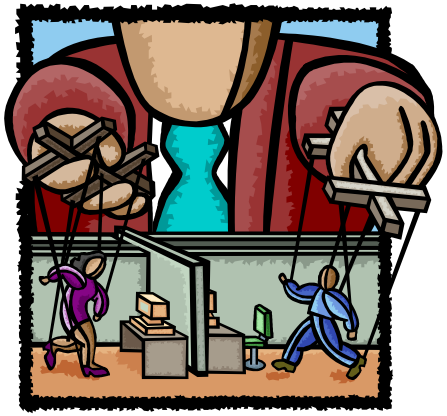
Earned Value Management conundrum with Agile

- Because EVM requires quantification of a project plan, it is often perceived to be inapplicable for Agile software development projects



- However, another school of thought holds that all work can be planned, even if in weekly time boxes or other short increments



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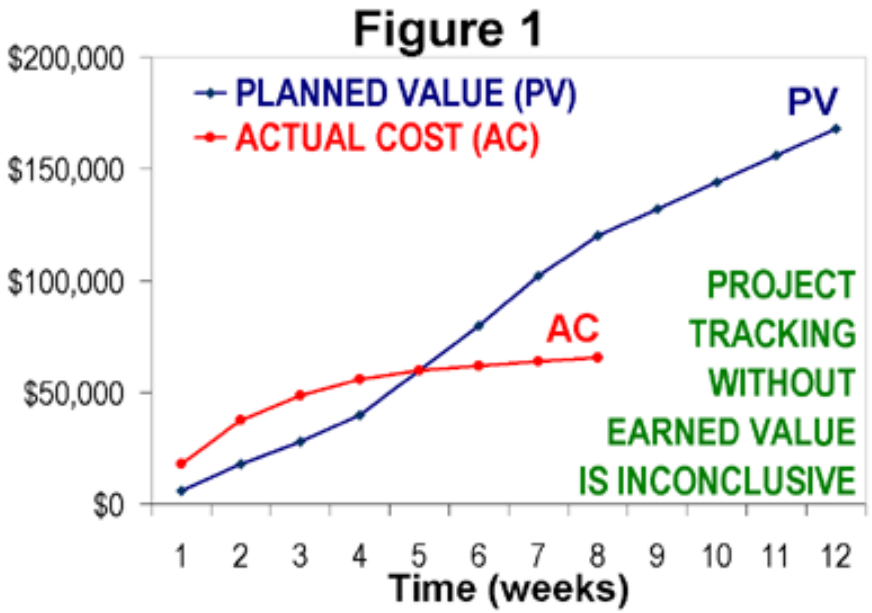
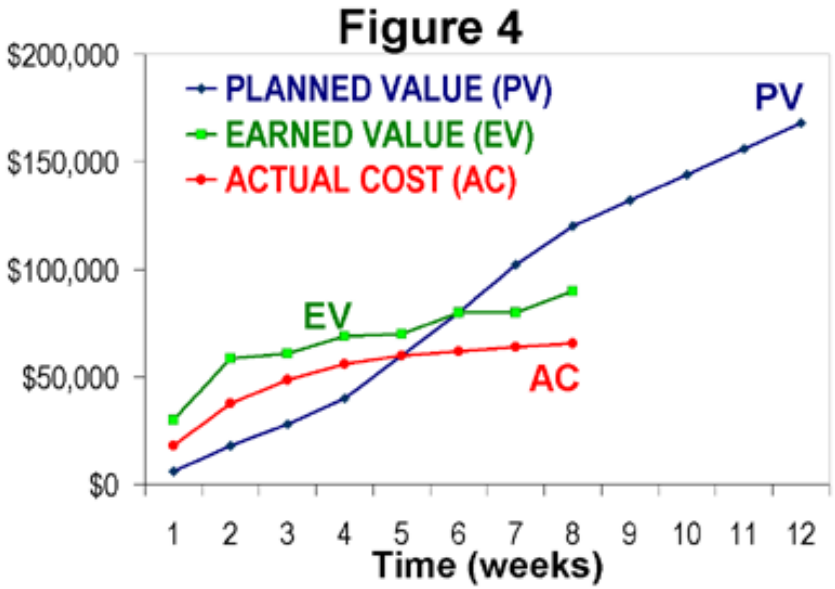
With EV the status is inconclusive





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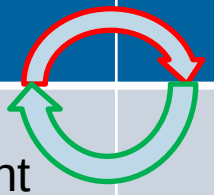
Agile EV

Establish a work breakdown structure for the capability desired	**Assign a value to each activity (Planned Value)**
Execute the Agile Sprint according to the plan and continuously measure quality key indicators for risk	Define “earning rules” for each activity



True understanding of cost and schedule performance *relies first on measuring quality objectively*

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Risk becomes visible

$$PVr = PVi_1 + PVi_2 + \ldots PVi_n$$

Planned Value of the release (PVr) is maintained constant (constrained cost and time) by allowing PVi to be modified based on efficiencies, enlightenment, or risks realized/avoided (both pos / neg)

Since agile EV is the measure of schedule and cost adherence to the PVi, software intensive risks becomes visible based upon the *degree of difficulty difference between the PVi and EVa*

$$EVa = \sum_{start}^{current} PVi$$

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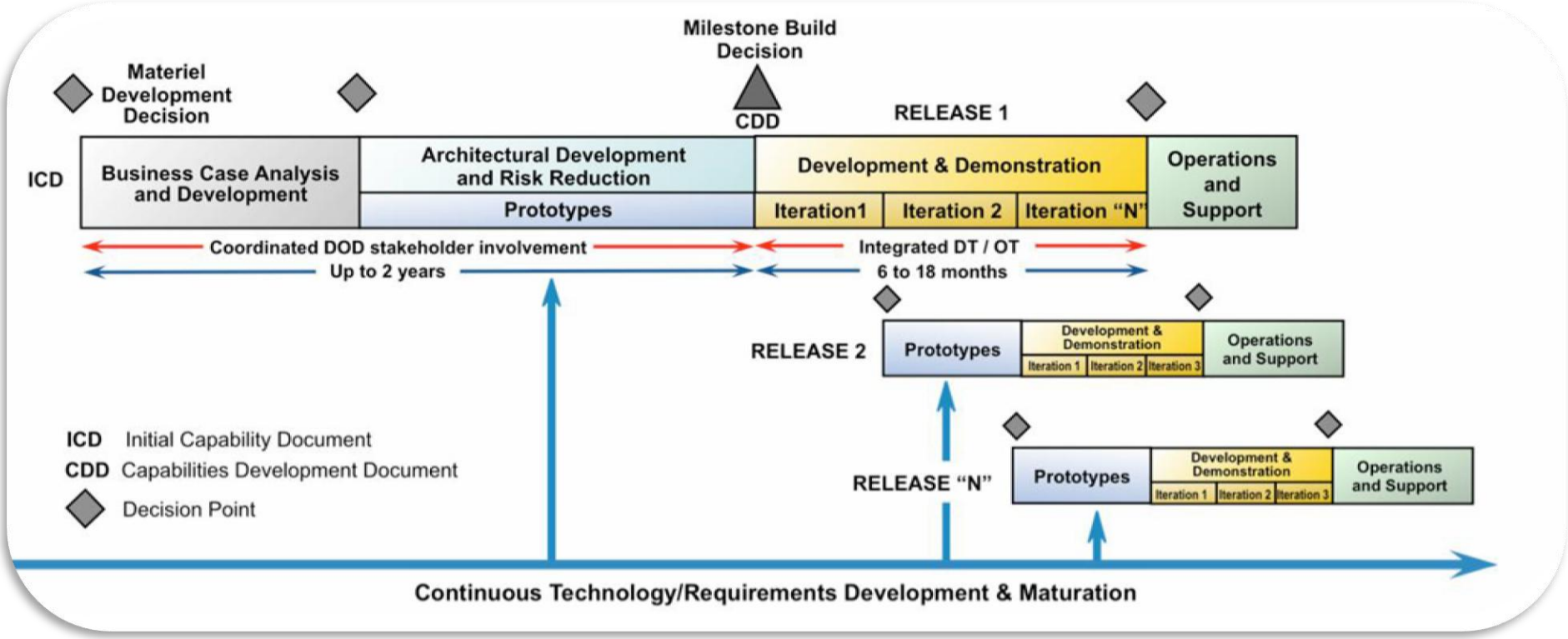
Change is coming

FY2010 NDAA Section 804



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The Next Sprint has already started

- ☑ constant measure of schedule achieved
- ☑ constant measure of actual cost incurred
- ☑ constant measure of quality tested

- ☑ Agile Earned Value

Risk is actionable with Agile processes

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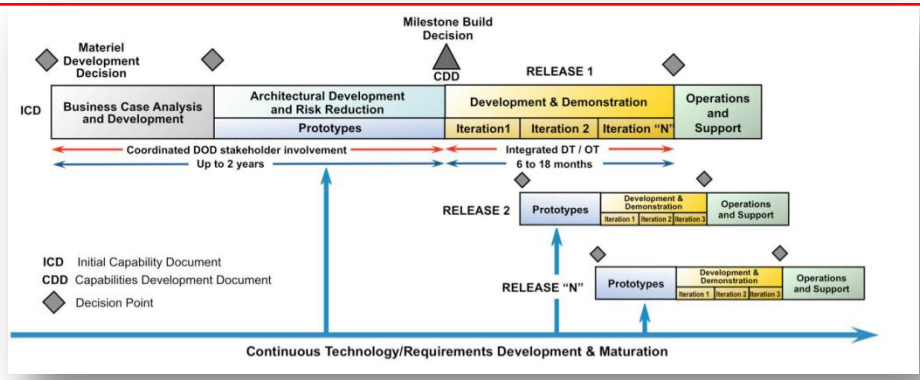
Innovation comes with agile EVMS

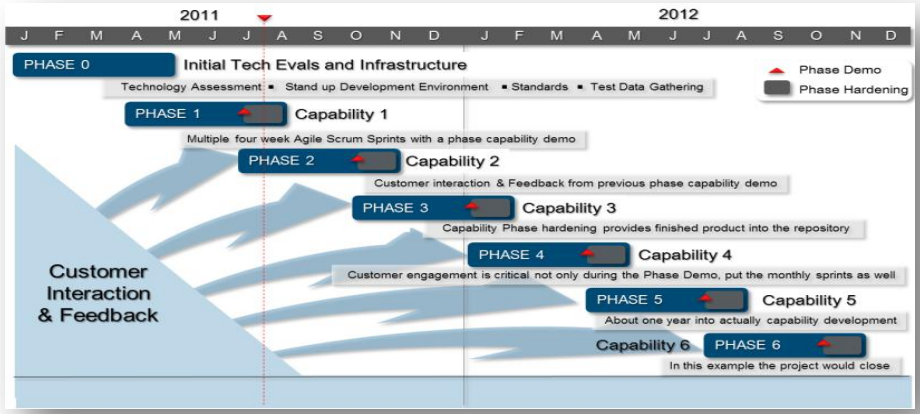
A project plan is developed that identifies work to be accomplished (work breakdown structure) both at the release level and with specific details at the iteration levels



A <u>valuation</u> of planned work at the release level, Planned Value “release” (PVr)

A pre-defined set of “earning rules” (metrics) to <u>quantify</u> the accomplishment of work called Earned Value (EV)

Prior to the start of the next capability iteration phase, the PVr remains constant (can always tell where you have been), but the Planned Value iteration(PVi) is adjustable to ensure that EVa is measuring the right items



Innovation comes with agile EVMS

Agile Scrums within an iteration phase provides actual cost information (c) and schedule (s) earnings as they are tightly coupled to the quality test event

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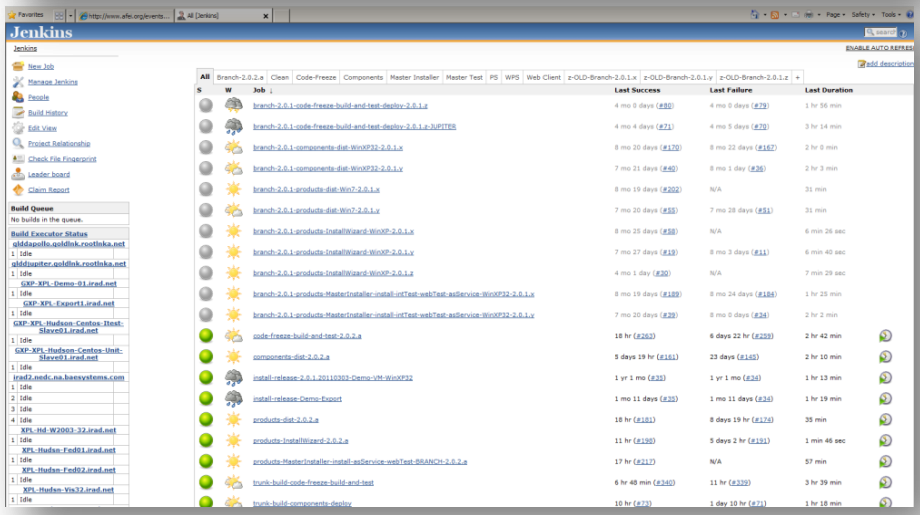

Continuous integration and test using automated test tools provides “continuous” monitoring of the build progress and flags areas of concern prior to the Scrum demo event (Q)